CLAIMS

1.   A method, comprising:

creating a drawing of a facial image;

comparing relationships among facial features in the drawing to corresponding relationships in facial images and associated caricatures; and

automatically exaggerating at least one relationship among facial features in the drawing based on the comparing.

2.   The method as recited in claim 1, wherein the comparing is performed at least in part by a kernel regression technique.

3.   The method as recited in claim 2, wherein the kernel regression technique assigns various weights to the facial images and associated caricatures based on a similarity to one or more relationships among facial features in the drawing.

4.   The method as recited in claim 1, wherein creating a drawing includes rendering the facial image into a set of points, wherein at least some of the points describe at least some of the facial features and wherein at least some distances between the points represent at least one relationship among facial features.

5.   The method as recited in claim 1, further comprising constraining the automatic exaggerating of a relationship among facial features to maintain the facial image within a range of probable faces.

6.   The method as recited in claim 5, wherein the constraining is based on a likelihood that the exaggerating conforms to allowable exaggerations in the associated caricatures.

7.   The method as recited in claim 5, wherein the constraining further includes:

deriving a first map representing differences between the drawing of the facial image and the facial image after the exaggerating;

deriving a second map representing averaged differences between the facial images and their associated caricatures; and

comparing the first map against the second map;

adjusting at least some of the differences in the first map to more closely approximate corresponding differences in the second map; and

adjusting an exaggerated relationship based on the adjusted first map.

8.   The method as recited in claim 7, wherein the adjusting at least some of the differences in the first map to more closely approximate corresponding differences in the second map uses a maximum likelihood model.

9.   The method as recited in claim 5, wherein the constraining includes:

deriving a map representing differences between the drawing of the facial image and the facial image after the exaggerating;

selecting one of the associated caricatures based on a similarity to the map; and

conforming the exaggerating to the selected caricature, wherein if exaggeration of a relationship varies beyond a threshold from a corresponding relationship in the selected caricature, then a degree of the exaggerating is altered to conform the relationship to the selected caricature.

10.   The method as recited in claim 9, wherein the selecting uses a maximum likelihood technique.

11.   The method as recited in claim 9, further comprising variably combining the drawing of the facial image with the selected caricature in order to produce a variably exaggerated caricature of the facial image.

12.   The method as recited in claim 1, further comprising selecting a relationship among facial features to exaggerate based on a variance of the relationship from a norm derived from the facial images in the database, wherein relationships having relatively high variance from the norm are selected for exaggeration.

13.   The method as recited in claim 12, wherein the variance of the relationship from the norm is determined by:

measuring one or more distances representing the relationship among facial features; and

comparing the one or more distances with corresponding average distances in the facial images.

14.   The method as recited in claim 12, wherein the selecting a relationship includes:

performing a kernel regression in order to map the relationship to similar relationships among similar facial features in the facial images; and

selecting the relationship for exaggeration if the relationship varies by a threshold from an average for the similar relationships.

15.   The method as recited in claim 12, wherein the selecting a relationship includes performing a kernel regression in order to map the relationship to similar relationships among similar facial features in the facial images, wherein the kernel regression further includes:

assigning weights to the facial images based on a similarity of the relationship to corresponding relationships among facial features in the facial images, wherein a high weight is assigned to a high similarity; and

applying a linear regression to the weighted facial images.

16.   The method as recited in claim 12, wherein the selecting a relationship includes:

measuring one or more distances representing the relationship among facial features;

assigning weights to the facial images based on a similarity of the relationship to corresponding relationships among facial features in the facial images, wherein a high weight is assigned to a high similarity; and

selecting the relationship for the exaggerating if one or more distances representing the relationship vary beyond a first threshold from one or more corresponding average distances among facial features derived from the facial images that are assigned a weight that exceeds a second threshold.

17. The method as recited in claim 1, further comprising varying a degree of the exaggerating to be applied to a relationship among facial features while constraining the exaggerating in order to maintain the facial image within a range of probable faces.

18. The method as recited in claim 17, wherein the degree of the exaggerating is selectable by a user.

19. The method as recited in claim 1, further comprising exaggerating one of a shape and a size of a facial feature.

20. A system, comprising:

means for rendering a facial image into a drawing;

means for comparing relationships among facial features in the drawing to corresponding relationships in facial images and associated caricatures; and

means for exaggerating at least one relationship among facial features in the drawing based on the corresponding relationships in the facial images and associated caricatures.

21. The system as recited in claim 20, further comprising means for constraining the exaggerating to maintain the facial image of the drawing within a range of probable faces.

22. The system as recited in claim 21, further comprising:

means for deriving a map representing differences between the drawing of the facial image and the facial image after the exaggerating;

means for selecting one of the associated caricatures based on a similarity to the map; and

means for conforming the exaggerating to the caricature.

23. The system as recited in claim 22, wherein the means for selecting includes means for performing a maximum likelihood technique.

24. The system as recited in claim 22, further comprising means for variably combining the drawing of the facial image with the selected caricature in order to produce a variably exaggerated caricature of the facial image in the drawing.

25. The system as recited in claim 20, wherein the means for comparing includes means for performing a kernel regression technique, wherein the kernel

regression technique assigns various weights to the facial images and associated caricatures based on a similarity to one or more relationships among facial features in the drawing.

26.   The system as recited in claim 20, further comprising means for varying a degree of the exaggerating to be applied to a relationship among facial features while constraining the exaggerating in order to maintain the facial image within a range of probable faces.

27.   A caricature engine, comprising:

a facial features and relationships locator to receive a facial image and locate a set of facial features and relationships among facial features in the facial image;

an exaggeration engine to compare the facial features and relationships in the facial image to facial features and relationships in a collection of pairs of facial images and associated caricatures in order to determine which of the facial features and relationships to exaggerate in the facial image; and

an exaggeration constraint engine to compare exaggerations applied to the facial image with at least one selected caricature from the associated caricatures in order to conform a degree of the exaggerations to the at least one selected caricature.

28.   The caricature engine as recited in claim 27, further comprising a learning engine to compare the facial features and relationships in the facial image

to facial features and relationships in the collection by applying a kernel reduction technique.

29. The caricature engine as recited in claim 27, further comprising a variable warping engine to variably combine the facial image with the at least one selected caricature in order to produce a variably exaggerated caricature of the facial image, while maintaining the variably combined facial image and caricature within a range of probable faces

30. A user interface, comprising:

a first display area to depict a facial image;

a second display area to depict variably exaggerated facial features and relationships among the facial features of the facial image;

a third display area to depict a caricature of the facial image; and

a variable exaggeration controller to control a degree of variable exaggeration applied to one or more facial features and relationships in the facial image.

31. The user interface as recited in claim 30, wherein the first, second, and third display areas are shown simultaneously.

32. The user interface as recited in claim 30, further comprising a selectable list of facial features and relationships to be selected for variable exaggeration.

33.   The user interface as recited in claim 30, further comprising means for manually adjusting a size of a single feature or relationship.

34.   The user interface as recited in claim 30, further comprising means for manually changing a shape of a facial feature in one of the display windows.

35.   A computer readable medium containing instructions that are executable by a computing device to perform actions comprising:

comparing relationships among facial features in a facial image to corresponding relationships in a collection of facial images and associated caricatures; and

exaggerating at least one relationship among facial features in the facial image based on the comparing.

36.   The computer readable medium as recited in claim 35, further comprising instructions to constrain the exaggerating to maintain the facial image within a range of probable faces.

37.   The computer readable medium as recited in claim 35, further comprising instructions to:

derive a map representing differences between the facial image and the facial image after the exaggerating;

select a caricature from the collection based on a similarity to the map; and

conform the exaggerating to the caricature, wherein if exaggeration of a relationship varies beyond a threshold from a corresponding relationship in the

caricature, then a degree of the exaggerating is altered to conform the relationship to the caricature.

38.   The computer readable medium as recited in claim 37, wherein the selecting includes a maximum likelihood technique.

39.   The computer readable medium as recited in claim 35, further comprising instructions to combine the facial image with the caricature in order to produce a variably exaggerated caricature of the facial image.

40.   The computer readable medium as recited in claim 35, further comprising instructions to perform the comparing using a kernel regression technique, wherein the kernel regression technique assigns various weights to facial images and associated caricatures in the collection based on a similarity to one or more relationships among facial features in the facial image.

41.   The computer readable medium as recited in claim 35, further comprising instructions to allow a user to vary a degree of the exaggerating to be applied to a relationship among facial features while constraining the exaggerating in order to maintain the facial image within a range of probable faces.

42.   A database, comprising:

representations of at least parts of facial images; and

a representation of an associated caricature for each representation of at least part of a facial image.

43. The database as recited in claim 42, wherein differences between the representations of at least parts of facial images and their associated caricatures are addressable by a kernel reduction technique for iterative comparison with features and relationships among features in a drawing of a facial image.

44. The database as recited in claim 43, wherein an exaggeration to be applied to at least one of the features and relationships in the drawing is constrainable to a degree of exaggeration between one of the representations of at least part of a facial image in the database and its associated caricature in the database.

45. An automated method, comprising:

collecting pairs of facial images, wherein each pair includes an unexaggerated facial image and a caricature of the unexaggerated facial image;

receiving a facial drawing to compare with the pairs of facial images;

iteratively comparing characteristics of the facial drawing with characteristics in the pairs; and

selecting one of the pairs as a model for variably exaggerating at least part of the facial drawing.

46. The automated method as recited in claim 45, wherein the characteristics include relationships among facial features in the facial drawing.

47. The automated method as recited in claim 45, wherein the iterative comparing uses a kernel reduction technique.

48. The automated method as recited in claim 45, wherein the iterative comparing constrains the variable exaggeration of a relationship among facial features in the facial drawing to a degree of exaggeration of a corresponding relationship in the model.